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able society. Of course this involves a circle; but there is no way of escaping it.

J. E. CREIGHTON

SCIENTIFIC BOOKS

An Introduction to the Study of the Protozoa.

With Special Reference to the Parasitic Forms. By E. A. MINCHIN, Ph.D., F.R.S., Professor of Protozoology in the University of London. London, Edward Arnold; New York, Longmans, Green & Co. Pp. x + 517. Price \$6.00 net.

When an "Introduction" to the study of a special group covers over 500 pages of which perhaps a third are in fine print, a reader might infer that the main text would require a lifetime to prepare and digest. Of the many students of the group described in this book not a few have given an entire lifetime and others are now devoting all of their energies to the main text. Amongst these Professor Minchin is one of the most conspicuous and best informed. We think, however, that he is a trifle too modest in calling this splendid presentation of a difficult field an "Introduction," for the great variety of subjects discussed, the judicial attitude assumed, and the wealth of references used, are more characteristic of a treatise than of a primer.

Like the majority of general works on Protozoa, this one consists of two main sections, one devoted to general problems, the other to special groups. Such treatment involves more or less repetition and requires many cross references, but is most useful in picturing the nature and extent of problems in general biology, as illustrated by the Protozoa. In the general section four chapters are devoted to the distinctive characters, modes of life, general physiology and reproduction; five chapters to the general organization and life cycles, and one chapter to fertilization and sexual phenomena of the Protozoa. In the more special part, one chapter is given to the Sarcodina, two to the Mastigophora, three to the Sporozoa and one to the Infusoria, while a concluding chapter deals with the general phylogeny of the Protozoa and with two doubtful groups, the Spirochaetida and the

Chlamydozoa. The sub-title of the book disarms criticism of the disproportionate treatment of the four special groups, the Infusoria receiving the least attention, but such treatment may go a long way in overcoming the too-common generalization that ciliates are the Protozoa, and may help to a broader comprehension of the biological value of representatives of the other and larger groups of unicellular animals.

The problem of karyokinesis, especially the evolution from simple to complex mitotic structures, is well treated; a more critical discussion of the so-called chromosomes in Protozoa and the evolution of chromosomes would have been a welcome addition, since there is the greatest confusion at the present time over this apparently simple matter. The terms "chromatinic" and "achromatinic" are used in place of chromatic and achromatic, the change being adopted on the ground that the latter terms have a distinctly different meaning in optics. We agree that the change is desirable, but there is little probability that it will have a wide following, since these terms are firmly grounded in modern biology. Another new term—"chromidosome" for the smallest unit of chromatin inside or outside of the nucleus, is most useful so also is the word "endosome" for the German term "Binnenkörper."

Minchin makes a distinction between Protozoa of "cellular" grade and those of "bacterial" grade, but the effort seems to be somewhat obscure and does not help much in defining the Protozoa, having a perplexing rather than a simplifying effect. The bacterial nucleus is sometimes a single karyosome which might be compared with a typical nucleus; more often there is no morphological nucleus, but chromatin granules are scattered about the entire organism. It is presumably this type of bacterial structure that Minchin refers to in Protozoa of bacterial grade, and if so the Spirochaetes might well fall within such a group; but these are treated separately as a doubtful group. On the other hand, some well-defined Protozoa, such as *Dileptus gigas*, for example, have similar scattered chromatin

masses, but could scarcely be considered of bacterial grade. Certainly all undoubted Protozoa are of the cellular grade and are characterized by nuclei more or less different from typical nuclei of tissue cells.

The discussion on syngamy and sex, although slightly halting in argument, is admirably presented. Minchin apparently favors the rejuvenescence theory, but finds a logical difficulty in the phenomena of parthenogenesis and autogamy and has apparently overlooked some recent work on variations as an outcome of amphimixis, as well as works recording failures to rejuvenate after conjugation in cultures. This general problem, however, has been so recently re-opened that the literature may not have reached him in time to be incorporated.

In dealing with the flagellates, especially the blood-dwelling forms, Minchin is perfectly at home and speaks with a first-hand knowledge that carries conviction. The life histories of the Trypanosomes and other hæmoflagellates are given with a firm touch and many of the facts are from his own hitherto unpublished results.

In the section on general physiology the usual physiological activities are concisely, but well, treated. The matters of degeneration, regeneration, and the phenomena of decreasing vitality in Protozoa are somewhat disappointing in the mode of treatment; so also is the neglect, throughout the volume, of evidence derived from the study of various types of Protozoa by the bacteriological culture methods, which for certain groups of the Protozoa, notably the Amœbæ, promise to throw a flood of light on the vexed question of pathogenic species. It is most uncharitable, however, to cavil over these minute defects, if indeed they are defects, when the vast and rapidly growing literature on the Protozoa is so admirably welded together in a readable whole, and we shall have occasion many times repeated, to thank the author for his labor, his critical insight, and for the judicious care with which he has selected the material embodied in this volume.

GARY N. CALKINS

Food in Health and Disease. By NATHAN S. DAVIS, JR., A.M., M.D. P. Blakiston's Son & Co. 1912. Second edition. Pp. 449.

It is fair to assume from a statement in the preface that the author expects this work to be used in the instruction of physicians and nurses. It would seem desirable that any publication to be used in this way for instruction in the principles of nutrition should present the latest and most reliable knowledge. This volume fails to meet this requirement. Not only does it contain many statements which must be regarded as erroneous, but some of the most important advances in our knowledge of food chemistry and metabolism receive no consideration.

One looks in vain, for instance, for a discussion of the recent additions to our knowledge of the efficiency of individual proteins for constructive and maintenance purposes. Osborne and Mendel have shown that the alcohol-soluble protein of maize, when it is the only protein fed and is supplemented by the other classes of nutrients in efficient forms, does not serve to maintain life, much less build tissue. Marked differences are observed in the efficiency of other proteins. Without question, the influence of certain food substances upon the secretion of the digestive fluids should also receive extended attention in a study of dietetics. It would seem that whoever is to assume the direction of the diet of the well and the sick should have some inkling of this most important new knowledge.

It is easier to be charitable toward omissions of this kind, however, than towards inaccuracies and looseness of statement. It is fair to inquire what justification there is for the statement that carbon dioxide "aids digestion by promoting chemical changes and muscular activity." The statements that "tissue waste is most rapid under a protein diet," "that nitrogenous food in greater quantities than are strictly needed to maintain nitrogen equilibrium will cause a waste of tissues as well as repair," and "in other words, all changes are stimulated by proteins," are most surprising. It is true that the body tends to